

# TRIANGULATION EVALUATION PROTOCOL PROBLEM-BASED ACCESS TO KNOWLEDGE: INSTRUMENT DEVELOPMENT

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A microcomputer-based system designed to provide nurses and physicians access to expert synthesized knowledge in the area of pulmonary arterial waveform troubleshooting has been developed and implemented. Beta testing was conducted on a 10 bed Respiratory Surgical ICU. The system is implemented on an 18 bed medical ICU; a 19 bed Cardiac ICU serves as control. The poster will describe instrument development and testing in four evaluative domains using triangulation methods: system design, instructional adequacy, knowledge and decision-making. During system design, formative evaluation was conducted in the production and implementation phases. Fifteen experienced and novice clinicians (10 RN, 5 MD) utilized the system during a 60-90 minute session. Subjects were able to free browse. Comments were taped and analyzed using a typical verbal protocol analysis technique. Computer keyboard strokes were also logged. All subjects responded to a 25 item instrument using Likert scaling developed to assess understanding the system, ease to use, attractiveness, and content accuracy. Feedback resulted in minor revisions to the system features, content and graphics. Instructional adequacy will be measured with a modified Underwood Software Evaluation Tool, a 30 item instrument using Thurstone's equal-appearing interval scaling technique. Items estimate attitude toward content (10), pedagogy (6), technical quality (6) and policy issues (8). An experienced RN and MD in the beta site pretested the instrument for feasibility, applicability, and general appropriateness. Knowledge of waveform interpretation and troubleshooting will be measured with a 30 item multiple choice test. Following classical methods of test construction, a table of specifications was created to identify major subject areas, overall system objectives, and desired cognitive domain. An initial set of 90 items were generated and reviewed by four program authors for appropriateness, correctness, and readability. Twelve items were eliminated, and

several others were edited to increase clarity and utilize better distractors. The final set consisted of 78 multiple choice items and was piloted with 18 RN's and 4 MD's in the beta site. Scores ranged from 32%-95%, with discrimination powers from -0.03-0.67. The final test consists of 30 items, ranging from easy to difficult, with adequate discrimination power, with consideration to representation to the content areas. Decision skills will be evaluated through clinical simulations constructed according to the methods developed by Barrows and Tamblyn. The simulations are designed to utilize information readily available, to describe sequential interdependent actions, and to provide immediate realistic. To select the content area we asked several clinicians to rate the various waveforms according to frequency and complexity. The two cases represent a common, relatively easy situation, and a less common situation representing higher risk if improperly managed. In the opening scene of the scenarios a typical patient is described and the content of the stimulus situation is written for the first card. Using experts, the optimal path was defined, using a storyboard technique to examine all possible sequences of actions including assessment, management and diagnosis, consultation, and additional data sources. The card decks were tested by program developers. The cases were piloted by 3 nurses in the beta site to examine technical feasibility of implementation. Time for use ranged from 10-30 minutes. Directions required minor modifications, and we determined the simulations are able to be self-administered. In summary, the evaluation design's strength is that it incorporates multiple methods, it focuses on strong collaborative effort between content developers and potential users, and is taking place within an contextual background of open communication.